

Test Plan for Shipboard Testing

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1. Project Overview

Sunrui Corrosion and Fouling Control Company (Sunrui CFCC) has developed a ballast water management system (BalClor™ BWMS). The BalClor™ BWMS consists of a filtration process, electrolyzing to produce active substance which can kill marine living things, and a neutralization process. When ballasting, the ballast water is firstly filtrated by an automatic self-cleaning filter with 50µm screen, to remove most of the plankton and solid particles which size is larger than 50µm. Then a side stream of seawater flows through an electrolytic unit to produce sodium hypochlorite solution, which is injected back into the main ballast stream after degassing and makes the Total Residual Oxidant (TRO) concentration reach a specific value (ranging from 7.5 to 9.5mg/L). The active substances with such concentration can kill the residual planktons, pathogens, larvae or spores etc effectively, which meets regulation D-2. When de-ballasting, sodium thiosulfate solution is added into the treated ballast water to neutralize the residual Total Residual Oxidants (TRO). The flow of the neutralization reagent is automatically controlled by control system.

Sunrui CFCC has started the development of ballast water treatment technology since 2007. A prototype BWMS with treatment capacity of 250m³/h was designed and manufactured in 2007. In accordance with the requirements of G8, a land-based testing facility was established in Qingdao in June, 2008. Then in August 2008, the test of the prototype functions, improvement and test of biological efficacy was conducted. Based on a series of tests, the operating parameters of the equipment have been defined, and the BWMS was developed and improved. In August 2009, the application for basic approval was submitted to IMO. And the Basic Approval was granted to the BalClor™ BWMS in March 2010 at MEPC 60. At the same time, application for Final Approval of the BWMS was submitted to IMO in March 2010. And will be evaluated by GESAMP-BWWG in May.

In the meantime, the type approval tests for China Classification Society (CCS) is ongoing. In December 2009, the land-based type approval tests were completed in accordance with G8.

This test outline determine the general plan of shipboard testing.

2. Objective

In accordance with the requirements of IMO G8, the shipboard testing of BalClor™ BWMS for type approval is intended to be carried out.

3. Test Method

3.1 Test Ship

Ship owner: China Shipping Co., Ltd

Ship basic information:

Ship code: ANPING3

Ship name: Anping3

IMO number: 8806139

Loading capacity: 35,000 tons

Rated flow of ballast pump: 720m³/h

Construction completion data: 1987-09-24

Flag: CCS

Ship flag port: Shanghai

Type of vessel: Stern engine bulk carrier

Construction plant: Jiangnan Shipyard

Control mode: Remote maintenance by control room

Overall length: 195m

Length between two columns: 185m

Breadth: 28.4m

Depth: 15.8m

Lifesaving: 40 people

Commercial speed: 12

Generator: Power (440/312 kW); Number of units (2/1); Frequency 50Hz; Voltage 400V; Phase system: three-phase; Emergency generator: 90kW

3.2 Ballast Water Management System (BalClor™ BWMS)

The full-scale BalClor™ BWMS used for the shipboard testing was designed and manufactured in accordance with the requirements of the IMO Guidelines (G8) and the relevant requirements of China Classification Society (CCS). The BWMS is

comprised of the following functional modules: self-cleaning filter with 50µm screen, electrolytic unit, controller, neutralizing unit, sampling unit, hydrogen / chlorine gas alarm, and necessary pumps and valves, etc. Its rated treatment capacity is 500-1000m³/h.

3.3 A Shipboard Test Cycle Includes:

.1 the uptake of ballast water of the ship; The ballast water is treated by the BWMS when uptaking, except in control tanks, and the influent water needs to be sampled and characterized.

.2 the storage of ballast water on the ship.

.3 the discharge of ballast water from the ship, meanwhile the neutralization is undertaken when discharging and the discharge treated water needs to be sampled and analyzed.

3.4 Control and Treated Ballast Tank

The two symmetrical bottom tanks on both side of the ship are used as control and treated ballast tank. The capacity of each tank is 700m³.

3.5 Success Criteria for Shipboard Testing

1. Test plan to be provided prior to testing;
2. Documentation that the BWMS is of a capacity within the range of the treatment rated capacity for which it is intended.
3. The amount of ballast water tested in the test cycle on board should be consistent with the normal ballast operations of the ship and the BWMS should be operated at the treatment rated capacity for which it is intended to be approved;
4. Documentation of the results of three consecutive, valid test cycles showing discharge of treated ballast water in compliance with regulation D-2;
5. Valid tests are indicated by uptake water, for both the control tank and ballast water to be treated, with viable organism concentration exceeding 10 times the maximum permitted values in regulation D-2.1 and control tank viable organism concentration exceeding the values of regulation D-2.1 on discharge.

3.6 Sampling Regime

3.6.1 For the control tank

1. Three replicate samples of influent water, collected over the period of uptake (e.g., beginning, middle, end); and
2. Three replicate samples of discharge control water, collected over the period of discharge (e.g., beginning, middle, end).

3.6.2 For treated ballast tank

1. Three replicate samples of influent water, collected over the period of uptake (e.g., beginning, middle, end); and
2. Three replicate samples of discharge treated water collected at each of three times during the period of discharge (e.g., 3 x beginning, 3 x middle, 3 x end);

To sample on time, the approximate time of ballast water uptake and discharge should be grasped before testing.

3.6.3 Sample sizes are:

1. For the enumeration of organisms greater than or equal to 50 micrometers or more in minimum dimension, samples of at least one cubic meter should be collected. If samples are concentrated for enumeration the samples should be concentrated using a sieve no greater than 50 micrometers mesh in diagonal dimension.
2. For the enumeration of organisms greater than or equal to 10 micrometers and less than 50 micrometers in minimum dimension, samples of at least one liter should be collected. If samples are concentrated for enumeration the samples should be concentrated using a sieve no greater than 10 micrometers mesh in diagonal dimension.
3. For the evaluation of bacteria a sample of at least 500 milliliters should be taken from the influent and treated water.

3.6.4 The source water for test cycles shall be characterized by measurement of salinity, temperature, particulate organic carbon and total suspended solids.

3.7 Trial Period

The test cycles including invalid and unsuccessful test cycles are to span a trial period of not less than six months.

It is requested to perform three consecutive test cycles that comply with regulation D-2 and which are valid in accordance with paragraph 3.5.5 of G8. Any invalid test cycle does not affect the consecutive sequence.

3.8 The Inspection of Bypass Alarm and Data Storage

3.8.1 The inspection of bypass alarm (G8 4.5.4)

During the shipboard testing period, the bypass alarm of the ballast water management system should be inspected in one test cycle.

Test method: In treatment cycle, bypass the ballast water treatment system, and check whether the BWMS active an alarm and the bypass event is recorded or not.

3.8.2 The inspection of data storage(G8 4.13)

During the shipboard testing period, inspect the ballast water treatment system data storage function at least once randomly.

Inspect whether the system is able to store data for at least 24 months, whether the data can be displayed or printed. In the event the control equipment is replaced, whether the system can provide means to ensure the data recorded prior to replacement remains available on board for 24 months.

3.9 For system operation throughout the trial period, the following information should also be provided:

1. documentation of all ballast water operations including volumes and locations of uptake and discharge, and if heavy weather was encountered and where;
2. the possible reasons for the occurrence of an unsuccessful test cycle, or a test cycle discharge failing the D-2 standard should be investigated and reported to the Administration;
3. documentation of scheduled maintenance performed on the system;
4. documentation of unscheduled maintenance and repair performed on the system;
5. documentation of engineering parameters monitored as appropriate to the specific system; and
6. documentation of functioning of the control and monitoring equipment.

3.10 Detection of Hydrogen and Chlorine

During the first cycle of shipboard testing, detect the content of hydrogen and chlorine in the air of relevant positions, as shown in table 3-1, 3-2 respectively.

Table 3-1 Detection of hydrogen (v/v %)

| Position | Around the device | Treatment tank vent | Hydrogen removal tank vent |
|-------------------------------|-------------------|---------------------|----------------------------|
| Before electrolysis | | | |
| Beginning of the electrolysis | | | |
| Middle of the electrolysis | | | |
| End of the electrolysis | | | |

Table 3-2 Detection of chlorine (mg/m³)

| Position | Around the device | Treatment tank vent | Hydrogen removal tank vent |
|-------------------------------|-------------------|---------------------|----------------------------|
| Before electrolysis | | | |
| Beginning of the electrolysis | | | |
| Middle of the electrolysis | | | |
| End of the electrolysis | | | |

The hydrogen and chlorine are detected by inspectors of Sunrui CFCC with the calibrated test facilities. And the tests are verified by China Classification Society (CCS).

4. Test Organization

Biological analysis and physical and chemical properties of the ballast water are tested by The First Institute of Oceanography, SOA (Center of Marine Environmental Measurement, The first institute of Oceanography, State Oceanic Administration).

The First Institute of Oceanography, State Oceanic Administration is a comprehensive oceanographic research institute engaged in applied and basic researches, high technology development and serving the public. The institute aims at promoting the marine science and technology progress and serving the marine management, marine safety and marine economy development and is an important marine science

research entity in the national science and technology innovation system. As one of the most important institution, the First Institute of Oceanography was successively awarded the key support institute and social welfare institute reform unit, and entered the national non-profit system as a main institute.

The First Institute of Oceanography, State Oceanic Administration is one of the marine science research units which are first to enter the national CMA quality management system and ISO9000 quality certification system. The institute has possession of class-A certificate of surveying and mapping qualification, class-A certificate of engineering designing and surveying qualification, class-A certificate of sea area measuring qualification, class-A certificate of sea area using qualification and certificate of national measurement qualification etc.

5. Standards and Guidelines

5.1 Guidelines for Biological Analysis

(1) Sournia A. 1978. Phytoplankton manual. Paris UNESCO. Pages 50-57, 88-96, 181-196.

(2) Andrew D. Eaton, Lenore S. Clesceci, Eugene W. Rice and Arnold E. Greenberg. 2005. 21st Edition Standard Methods for the examination of water & wastewater, 2005 Centennial Edition. APHA, AWWA, WEF. Biological Examination (10000), 10200 Plankton. Pages 10-2:10-18.

(3) SAC. 2007. National Standard of the People's Republic of China, GB 17378.7-2007. The specification for marine monitoring, Part 7: Ecological survey for offshore pollution and biological monitoring.

(4) Andrew D. Eaton, Lenore S. Clesceci, Eugene W. Rice and Arnold E. Greenberg. 2005. 21st Edition Standard Methods for the examination of water & wastewater, 2005 Centennial Edition. APHA, AWWA, WEF. Microbiological Examination (9000), 9215 Heterotrophic Plate Count. Pages 9-34: 9-41.

(5) USEPA. September 2002. Method 1603: Escherichia coli (E. coli) in Water by Membrane Filtration Using Modified membrane-Thermotolerant Escherichia coli Agar (Modified mTEC), EPA-821-R-02-023. 13pp.

(6) USEPA. September 2002. Method 1600: Enterococci in Water by Membrane

Filtration Using membrane-Enterococcus Indoxyl- β -D-Glucoside Agar (mEI), EPA-821-R-02-022. 14pp.

(7) FDA. May 2004. Bacteriological Analytical Manual Online, Chapter 9, Vibrio.

(8) AQSIQ. 2007. Profession Standard of the P.R. China for Entry-Exit Inspection and Quarantine, SN/T 1933.1-2007, Detection of *Enterococci* in food and water-Part 1: Method for plate count and MPN. 13pp.

(9) Ministry of Health P.R. China. 2008. The P.R. China health profession standard, WS 289-2008, Diagnostic criteria for cholera. 10pp.

(10) SAC. 2006. National Standard of the People's Republic of China, GB/T 5750.12-2006, Standard examination methods for drinking water-microbiological parameters. 34pp.

(11) SAC. 2008. National Standard of the People's Republic of China, GB/T 4789.7-2008, Microbiological examination of food hygiene-Examination of *Vibrio parahaemolyticus*. 14pp.

5.2 Guidelines for Physical and Chemical Properties of Seawater

(1) SAC. 2007. National Standard of the People's Republic of China, GB 17378.4-2007 The specification for marine monitoring—Part 4: Seawater analysis. 25-Temperature, Thermometer. Pages 79-80.

(2) SAC. 2007. National Standard of the People's Republic of China, GB 17378.4-2007 The specification for marine monitoring—Part 4: Seawater analysis. 29-Salinity, Salinometer Method. Pages 92-95.

(3) SAC. 2007. National Standard of the People's Republic of China, GB 17378.4-2007 The specification for marine monitoring—Part 4: Seawater analysis. 27-Total Suspended Solids, Gravimetric Method. Pages 88-91.

(4) SAC. 2007. National Standard of the People's Republic of China, GB 17378.4-2007 The specification for marine monitoring—Part 4: Seawater analysis. 34-Total Organic Carbon (TOC), Non-Dispersive Infra-Red Spectroscopy. Pages 105-107.

6. Experimental Process

6.1 Facilities operation when ballast

- .1 Close the air switch of the main power;
- .2 Open the front door of controller, close the air switch of the main power of controller, and close all air switches;
- .3 Close the door of controller;
- .4 Start automatically the touch screen after power and enter human-machine interface (HMI) automatically;
- .5 Click on "treatment" button in the touch screen and enter ballast water treatment equipment operation interface; Then click on "treatment mode" button, and enter automatic working state;
- .6 Set TRO concentration value between 7.5 and 9.5 mg/L;
- .7 Click on "start-stop" button and enter into starting condition. The treatment system will start and perform self-checking each alarm signal automatically;
- .8 When the treatment is finished, click on "start-stop" button and enter stopping state. The treatment system will stop automatically.
- .9 Disconnect all the air switches and the main power switch;

6.2 Facilities operation when discharge

- .1 Close the air switch of the main power; check whether or not liquid level of neutralizers level is in appropriate range;
- .2 Open the front door of controller, close the air switch of the main power of controller, and close all air switches;
- .3 Close the door of controller;
- .4 Start automatically the touch screen after power and enter human-machine interface (HMI) automatically;
- .5 Click on "treatment" button in the touch screen and enter ballast water treatment equipment operation interface; Then click on "treatment mode" button, and enter automatic working state;
- .6 Click on "neutralization " button, start neutralization system.
- .7 When the discharge is finished, click on "neutralization " button and stop neutralization system;

.8 Disconnect all the air switches and the main power switch;

6.3 sampling

All the samples should be taken after the BWMS is in stable operation for more than 10 minutes.

7. Test Record

7.1 Record the volumes and locations of uptake and discharge, and if heavy weather was encountered and where.

7.2 Environmental parameters sampling records of inflow water

The information such as environmental parameters of seawater for both the control and treated ballast tank (temperature, salinity, particulate organic carbon (POC) and total suspended solids (TSS)), sampling time and sampling volumes etc. should be recorded during the test cycle.

7.3 Biological analysis sampling records

The sampling process for organisms greater than or equal to 50 micrometres or more in minimum dimension, organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension and bacteria should be recorded separately.

7.4 Test result records of hydrogen and chlorine

7.5 The possible reasons for the occurrence of an unsuccessful test cycle, or a test cycle discharge failing the D-2 standard should be investigated and recorded.

7.6 Scheduled and unscheduled maintenance and repair performed on the system.

7.7 Working records of the control and monitoring equipment.

8. Staff and Division

The shipboard tests of type approval will be accomplished by the research and development department of Sunrui CFCC together with the test institution The First Institute of Oceanography, SOA. The personnel division is as follows:

Staff Qualifications and Responsibilities

| Name | Professional Title | Special field of study | Company or Organization | Responsibility Contents |
|---------------|--------------------|-----------------------------|--|--|
| Liu Guangzhou | Professor | Electrochemical engineering | Sunrui Corrosion and Fouling Control Company | Project leader, responsible for working out the outline of the shipboard testing and carrying out the plan |
| Liu Xuelel | Engineer | Electrical engineering | | Installation and adjustment of BalClor™ BWMS |
| Wang Zhilei | Engineer | Electrical engineering | | Operation of the BalClor™ BWMS, detection of hydrogen and chlorine |
| Ding Hui | Engineer | Applied Chemistry | | Recording the system's running conditions during the shipboard testing and , assisting the test institution on sampling |
| Wang Baodong | Professor | Marine Chemistry | The First Institute of Oceanography, SOA | Responsible for measuring sea water environmental parameters, include of sampling, storage, transportation and detection |
| Sun Xia | Engineer | Marine Chemistry | | |
| Tian Li | Professor | Marine Biology | | Responsible for biology analysis, include of sampling, storage, transportation, and measuring |
| Xie Linpin | Engineer | Marine Biology | | |
| Sun Pin | Engineer | Marine Biology | | |

9. Safety Measures

All staffs participating in the experiment should get a clear division of labor, actions such as absence and going beyond other's commissions are absolutely not allowed. When an emergency accident occurs, the situation should be reported to the project leader immediately, by whom a troubleshooting plan must be carried out at once, avoiding any further safety problems. In addition, those present should also be careful of the situations as follows:

9.1 Electrical Safety

Power and electrical equipments must be switched on only by professional staff

(Wang Zhilei, Liu Xuelei), other members' unauthorized operation is especially forbidden. If the device needs to be connected to the power or maintained, the power source must be cut off firstly, it can only be operated by professional staffs in condition of insulation. For whatever reason when personal electric shock happens, the present people should cut off the power of the connected parts immediately, avoiding further serious personal injuries or casualties.

9.2 To avoid bumping and falling

The space of the cabin is narrow and small, and it's steel structure with many edges and corners. Do concentrate when boarding to avoid bumping or scratch. Strengthen each one's awareness of self-protection. Don't frolic on board.

9.3 Safety use of chemical reagent

Sodium thiosulfate is used to neutralize the Total Residual Oxidants (TRO) when discharging ballast water. When preparing sodium thiosulfate solution of proper concentration, the protective clothing, gloves and protective glasses should be put on during the operation.

10. Appendix: Test Record Form

Sample ID rules:

TC01T: The treatment cycle of the first shipboard testing cycle.

TC01C: The control cycle of the first shipboard testing cycle.

INF: Influent water

DIS: Discharge water

BEG: Beginning of uptake or discharge of ballast water

MID: Middle of uptake or discharge of ballast water

END: End of uptake or discharge of ballast water

EP: Environmental parameters

50u: Organisms greater than or equal to 50 micrometres or more in minimum dimension

10u: Organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension

BAC: Bacteria

Table 1

Test cycle: _____

Situation about the uptake and discharge of ballast water, and the weather

Situation about the uptake and discharge of ballast water

| | Date | Volumes of uptake (or discharge), m ³ | Ballast water flow, m ³ /h | Location |
|--------------------------------|------|--|---------------------------------------|----------|
| The uptake of ballast water | | | | |
| The discharge of ballast water | | | | |

If heavy weather was encountered: (Yes/No)

If yes, describe the location and situation:

Sampler:

Witness:

Date:

Date:

Table 2

Test cycle: _____

Record of influent water (source water) sampling for environmental parameters

| Sample NO. | Sampling time | Sampling volume |
|----------------|---------------|-----------------|
| TC01T-INF-EP-1 | | |
| TC01T-INF-EP-2 | | |
| TC01T-INF-EP-3 | | |
| TC01C-INF-EP-1 | | |
| TC01C-INF-EP-2 | | |
| TC01C-INF-EP-3 | | |

Environmental parameters that need to measure (4 parameters): temperature, salinity, POC and TSS.

Sampler:

Witness:

Date:

Date:

Table 3

Test cycle: _____

Record of sampling for organisms' analysis

| Sample NO. | Sampling time | Sampling volume |
|----------------------|---------------|-----------------|
| TC01T-INF-BEG-50u-1 | | |
| TC01T-INF-BEG-10u-1 | | |
| TC01T-INF-MID-50u-2 | | |
| TC01T-INF-MID-10u-2 | | |
| TC01T-INF-END-50u-3 | | |
| TC01T-INF-END-10u-3 | | |
| TC01C-INF-BEG -50u-1 | | |
| TC01C-INF-BEG -10u-1 | | |
| TC01C-INF-MID-50u-2 | | |
| TC01C-INF-MID -10u-2 | | |
| TC01C-INF-END-50u-3 | | |
| TC01C-INF-END-10u-3 | | |
| TC01T-DIS-BEG-50u-1 | | |
| TC01T-DIS-BEG-50u-2 | | |
| TC01T-DIS-BEG-50u-3 | | |
| TC01T-DIS-BEG-10u-1 | | |
| TC01T-DIS-BEG-10u-2 | | |
| TC01T-DIS-BEG-10u-3 | | |
| TC01T-DIS-MID-50u-1 | | |
| TC01T-DIS-MID-50u-2 | | |
| TC01T-DIS-MID-50u-3 | | |
| TC01T-DIS-MID-10u-1 | | |
| TC01T-DIS-MID-10u-2 | | |
| TC01T-DIS-MID-10u-3 | | |

| | | |
|---------------------|--|--|
| TC01T-DIS-END-50u-1 | | |
| TC01T-DIS-END-50u-2 | | |
| TC01T-DIS-END-50u-3 | | |
| TC01T-DIS-END-10u-1 | | |
| TC01T-DIS-END-10u-2 | | |
| TC01T-DIS-END-10u-3 | | |
| TC01C-DIS-BEG-50u-1 | | |
| TC01C-DIS-BEG-10u-1 | | |
| TC01C-DIS-MID-50u-2 | | |
| TC01C-DIS-MID-10u-2 | | |
| TC01C-DIS-END-50u-3 | | |
| TC01C-DIS-END-10u-3 | | |

Sampler:

Witness:

Date:

Date:

Table 4

Test cycle: _____

Record of sampling for the evaluation of bacteria

| Sample NO. | Sampling time | Sampling volume |
|-----------------------|---------------|-----------------|
| TC01T-INF-BEG-BAC-1 | | |
| TC01T-INF-MID-BAC-2 | | |
| TC01T-INF-END-BAC-3 | | |
| TC01C-INF-BEG- BAC-1 | | |
| TC01C-INF-MID- BAC-2 | | |
| TC01C-INF-END- BAC-3 | | |
| TC01T-DIS-BEG-BAC-1 | | |
| TC01T-DIS-BEG-BAC-2 | | |
| TC01T-DIS-BEG- BAC-3 | | |
| TC01T-DIS-MID- BAC-1 | | |
| TC01T-DIS-MID- BAC-2 | | |
| TC01T-DIS-MID- BAC -3 | | |
| TC01T-DIS-END-BAC-1 | | |
| TC01T-DIS-END-BAC-2 | | |
| TC01T-DIS-END-BAC-3 | | |
| TC01C-DIS-BEG-BAC-1 | | |
| TC01C-DIS-MID-BAC-2 | | |
| TC01C-DIS-END-BAC-3 | | |

The following indicator microbes need to be evaluation for each sample: *Vibrio cholerae* (serotypes O1 and O139), *Escherichia coli*, Intestinal *Enterococci*

Sampler: _____

Witness: _____

Date:

Date:

Table 5

Test cycle: _____

Detection records of hydrogen and chlorine

Detection of hydrogen (v/v %)

| Position | Around the device | Treatment tank vent | Hydrogen removal tank vent |
|-------------------------------|-------------------|---------------------|----------------------------|
| Before electrolysis | | | |
| Beginning of the electrolysis | | | |
| Middle of the electrolysis | | | |
| End of the electrolysis | | | |

Detection of chlorine (mg/m³)

| Position | Around the device | Treatment tank vent | Hydrogen removal tank vent |
|-------------------------------|-------------------|---------------------|----------------------------|
| Before electrolysis | | | |
| Beginning of the electrolysis | | | |
| Middle of the electrolysis | | | |
| End of the electrolysis | | | |

Sampler:

Witness:

Date:

Date:

Table 6

Record for maintenance and repair

Record of scheduled maintenance

| | |
|-------------------------|--|
| Maintenance date | |
| Maintainer (signature): | |
| Maintenance contents: | |

Record of unscheduled maintenance

| | |
|-------------------------|--|
| Maintenance Date | |
| Maintainer (signature): | |
| Maintenance contents: | |

Record of unscheduled repair

| | |
|-------------------------|--|
| Repair date | |
| Maintainer (signature): | |
| Repair contents: | |

Witness: _____

Date: _____

Table 7

Record for working situation of control and monitoring equipment

Control equipment

Working situation description of control equipment:

Recorder (signature):

Date:

Monitoring equipment

Description of monitoring equipment:

Recorder (Signature):

Date:

Table 8

Record of unsuccessful or invalid test cycle

| | |
|---|--|
| Test cycle number: | |
| Situation description of test cycle that is unsuccessful or discharge failing the D-2 standard | |
| Reasons for unsuccessful or failing the D-2 standard | |
| <p>Recorder (signature): _____ Date: _____</p> <p>Witness (signature): _____ Data: _____</p> | |

Table 9

Inspection record of bypass alarm

Status: system bypass

Description of automatic bypass alarm and event record:

Inspector:

Date:

Witness:

Date:

Table 10

Inspection record of data storage

| Inspection contents | Result records |
|---|----------------|
| Whether the system can store data for 24 months, whether the data can be displayed or printed | |
| In the event the control equipment is replaced, whether the system can provide means to ensure the data recorded prior to replacement remains available on board for 24 months. | |

Inspector:

Date:

Witness:

Date: